WHAT IS CLAIMED IS:

1. An imaging method for detecting rare cells comprising:

sweeping a radiation beam along a scan path on a sample;

moving the sample generally perpendicularly to the scan path of the radiation beam sweeping, the moving cooperating with the sweeping so that the beam illuminates the entirety of the sample;

collecting light produced by beam interaction with the sample using at least one proximate element of an array of fiber optic first ends;

transmitting the collected light along a fiber associated with the at least one proximate element, the fiber channeling the collected light to a selected output region including an array of fiber optic second ends, wherein an arrangement of the array of fiber optic first ends is distinct from an arrangement of the array of fiber optic second ends;

detecting the collected light at the selected output region; and

coordinating the sweeping, moving, and detecting to generate an array of picture elements representative of at least a portion of the sample.

2. The method according to claim 1, wherein the sample includes a biological smear designed to identify rare cells from at least one of an organ or tissue of a body.

3. The apparatus according to claim 2, wherein the biological smear is designed to identify at least one of cancer cells, fetal cells, bacteria cells, kidney cells, liver cells, brain cells, cells expressing certain antibodies, or cells expressing with certain proteins.

4. The imaging method as set forth in claim 1, wherein the sample includes a biological smear, the imaging method further including:

marking the biological smear using a fluorescent material that selectively attaches to a selected type of cell, wherein the light produced by beam interaction includes fluorescence produced by the fluorescent material due to interaction with the radiation beam.

5. The method according to claim 4, wherein the step of marking the biological smear using a fluorescent material further includes using a plurality of fluorescent materials, at least some becoming fluorescent at lightwave frequencies different from each other.

6. The method according to claim 5, wherein the step of sweeping a radiation beam further includes sweeping a plurality of radiation beams at different wavelengths, the different wavelengths corresponding to the wavelengths at which the different fluorescent materials become fluorescent.

7. The method according to claim 6, wherein the step of sweeping the plurality of radiation beams at different frequencies occurs non-concurrently with each other.

8. The method according to claim 6, wherein the steps of sweeping the plurality of radiation beams at different frequencies occurs substantially simultaneously with each other.

9. The method according to claim 1, further including a step of filtering the array of generated picture elements to differentiate between those picture elements representing rare cells and those picture elements representing structures other than rare cells.

10. The method according to claim 9, wherein the filtering step investigates characteristics of the differentiated picture elements, the characteristics including at least one of an amount of differentiated picture elements, an intensity of the differentiated picture elements, the phase of the differentiated picture elements, or a shape of the differentiated picture elements.

11. An apparatus for identifying rare cells in a biological smear, the rare cells emitting a characteristic luminescence responsive to exposure to an excitation radiation, the apparatus including:

a translation stage that supports the biological smear;

a fiber optic bundle having a proximate bundle end of first fiber ends arranged to define an input aperture viewing the biological smear on the translation stage, and a distal bundle end of second fiber ends arranged to define an output aperture shaped differently from the input aperture and disposed away from the translation stage;

a scanning radiation source arranged in fixed relative position to the input aperture, the scanning radiation source scanning a radiation beam on the biological smear within a

viewing area of the input aperture, the radiation beam interacting with the biological smear to produce a light signal that is received by the input aperture and transmitted via the fiber optic bundle to the output aperture;

a photodetector arranged to detect the light signal at the distal bundle end; and

a processor that processes the light signal detected by the photodetector to identify existence of rare cells in the biological smear.

12. The apparatus according to claim 11, wherein the biological smear is designed to identify at least one of cancer cells, fetal cells, bacteria cells, liver cells, cells expressing certain antibodies, or cells expressing certain proteins or brain cells.

13. The apparatus according to claim 11, further including a controller which generates position information of at least one identified rare cell in the biological smear.

14. The apparatus according to claim13, further including an automated high-resolution device, arranged to receive the position information of the at least one rare cell, and to automatically move to the location of the at least one biological smear.

15. The apparatus according to claim 11 where the biological smear contains at least 20 million cells.

16. The apparatus according to claim 11, wherein the biological smear contains at least 50 million cells.

17. The apparatus according to claim 11, further including:

a motor arranged to move the sample in one of a translational and a rotational motion, the motor cooperating with the scanning radiation source to effectuate a rastering of the radiation beam over a selected area of the biological smear.

18. The apparatus according to claim 17, wherein the input aperture has a generally linear shape, the scanning radiation source scans the radiation beam along a beam trajectory parallel to the generally linear aperture, and the motor linearly translates the sample along a trajectory that is perpendicular to the beam trajectory.

19. The apparatus according to claim 18, wherein the motor rotates the sample about an axis that is normal to a surface of the sample, the input aperture has a generally linear shape extending radially away from the rotational axis, and the scanning radiation source scans the radiation beam along a beam trajectory parallel to the generally linear aperture.

20. The apparatus according to claim 11, wherein the light signal is a fluorescence generated by interaction of the radiation beam with a rare cell in the biological smear.

21. The apparatus according to claim 20, wherein the fluorescence generated by interaction of the radiation beam with the biological smear includes the biological smear being formed with at least one of fluorescent dye, quantum dots or DNA nano-particle probes.

22. The apparatus according to claim 11, wherein the biological smear includes a plurality of distinct markers, used to identify distinct cells or portions of cells.

23. The apparatus according to claim 11, wherein the scanning radiation source generates a plurality of radiation beams at a plurality of distinct wavelengths, wherein the distinct wavelengths correspond to the distinct markers.

24. The apparatus according to claim 11, wherein the fiber optic bundle is a first fiber optic bundle and the scanning radiation source is a first scanning radiation source, and the apparatus further includes,

a second fiber optic bundle,

a second scanning radiation source, and

the second fiber optic bundle and the second scanning radiation source are a distance from the first fiber optic bundle and the first scanning radiation source, wherein the translation stage is configured to move the sample from the first fiber optic bundle and the first scanning radiation source to the second fiber optic bundle and the second scanning radiation source.

25. An imaging method comprising:

sweeping a radiation beam along a linear path on a first portion of a sample;

moving the sample in a first direction generally perpendicularly to the linear path of the radiation beam sweeping, the moving in the first direction cooperating with the sweeping to raster the radiation beam on the sample;

collecting light produced by beam interaction with the first portion of the sample using at least one proximate element of an array of fiber optic ends;

transmitting the collected light along a fiber associated with the at least one proximate element, the fiber channeling the collected light to a selected output region, wherein a largest spatial dimension of the output region is substantially smaller than a largest spatial dimension of the array of fiber optic proximate ends;

detecting the collected light from the first portion of the sample at the selected output region;

moving the sample in a second direction, generally perpendicular to the first direction, a distance to a second portion of the sample;

sweeping the radiation beam along a linear path on a second portion of the sample;

moving the sample in a first direction generally perpendicularly to the linear path of the radiation beam sweeping, the moving in the first direction cooperating with the sweeping to raster the radiation beam on the sample;

collecting light produced by a beam interaction with the second portion of the sample using at least one proximate element of an array of fiber optic ends;

transmitting the collected light along a fiber associated with the at least one proximate element, the fiber channeling the collected light to the selected output region wherein the largest spatial dimension of the output region is substantially smaller than the largest spatial dimension of the array of fiber optic proximate ends;

detecting the collected light from the second portion of the sample at the selected output region; and

coordinating the sweeping, moving, and detecting to generate an array of picture elements representative of at least a portion of the first and second portions of the sample.

26. The method according to claim 25, wherein the sample is a biological smear designed to identify at least one of cancer cells, fetal cells, bacteria cells, liver cells or brain cells.

27. The method according to claim 26, wherein the light signal is a fluorescence generated by interaction of the radiation beam with a rare cell in the biological smear.

28. The method according to claim 27, wherein the fluorescence generated by interaction of the radiation beam with the biological smear, includes the biological smear being formed with at least one of fluorescent dye, quantum dots or DNA nano-particle probes.

29. An apparatus for identifying cells in a biological smear, the cells emitting a characteristic luminescence responsive to exposure to an excitation radiation, the apparatus including:

a translating stage that laterally translates the biological smear in a first direction and a second direction;

a fiber optic bundle including a plurality of fibers each having a first end and a second end, the first ends arranged to define a generally rectangular receiving aperture having a large aspect ratio, the second ends arranged to define an output aperture having a compact shape;

a radiation source that linearly sweeps an excitation radiation beam across the first portion of the biological smear with a sweep direction perpendicular to the first direction, an interaction region of the radiation source and a first portion of the biological smear being arranged relative to the receiving aperture such that characteristic luminescence produced in the interaction region is collected by the receiving aperture;

a controller that controls the translation of the translation stage in the first directions and the sweeping of the radiation source to raster the excitation radiation beam across the biological smear to identify rare cells in the first portion of the biological smear based upon the characteristic luminescence detected during the rastering, the controller further controls translation of the translation stage in a second direction to place a second portion of the biological smear in a position where the radiation source linearly sweeps the excitation radiation beam across the second portion of the biological smear with a sweep direction perpendicular to the first direction, an interaction region of the radiation source and the second portion of the biological smear being arranged relative to the receiving aperture such that characteristic luminescence produced in the interaction region is collected by the receiving aperture; and

a photodetector arranged to detect the collected characteristic luminescence of the first portion and the second portion of the biological smear at the output aperture.

30. The apparatus according to claim 29, wherein the biological smear is designed to identify at least one of cancer cells, fetal cells, bacteria cells, liver cells or brain cells.

31. The apparatus according to claim 29, further including a controller which generates a position information of at least one identified rare cell in the biological smear.

32. The apparatus according to claim 31, further including an automated high-resolution device, arranged to receive the position information of the at least one rare cell, and to automatically move to the location of the at least one biological smear.

33. The apparatus according to claim 32, wherein the high resolution device is an fluorescent microscope.